Optimization of a Step-stress Accelerated Life Test Plan by Genetic Algorithm

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Abstract

The accuracy of estimates obtained from a step-stress accelerated test (SSALT) depends on the distribution of failures among the different stress levels. When prior estimates are available for the lifetime parameters, random generation of times-to-failure can be used to simulate different SSALT defined with given profiles. Then, the simulation results can be processed to obtain posterior estimates and thus errors with prior estimates. The best SSALT could be found by minimizing this error but evaluating a wide enough range of plans takes a too long calculation time. On the other hand, limiting the possible plans may eliminate the best one. To shorten the minimization process without a priori limitation in the ranges of tested plans, this paper suggests using a genetic algorithm.

Keywords: SSALT, reliability, estimation accuracy, optimization, genetic algorithm.